

Book review

Eco-efficient Concrete

F. Pacheco-Torgal, S. Jalali, J. Labrincha and V. M. John. Woodhead Publishing Limited, Cambridge, UK, 2013, ISBN 978-0-85709-424-7 (print), ISBN 978-0-85709-899-3 (online), £180.00, 624 pp.

Whatever your position on the causes of global warming, there is no doubt that the need for more sustainable construction and construction materials is now very widely appreciated and debated. Moreover, the world domination by concrete as a structural material, which the lead editor of this book says is currently running at about 10 km³/year and is set to increase by around 200% over the next 40 years, means that finding ways of making and using concrete in more sustainable ways is an urgent and critical concern. Thus, this appropriately and succinctly titled book should be a welcome new addition to the abundant literature on concrete materials, with its state-of-the-art focus on the range of tactics and options available for achieving 'eco-efficient' concrete, both highlighting its importance and providing a wealth of technical information.

Dr Fernando Pacheco-Torgal, of the University of Minho in Portugal, is the lead editor, assisted by three other editors and about 25 chapter authors or co-authors from 12 different countries (eight in Europe, including the UK, plus China, Brazil, Turkey and Iran). In his introduction, Dr Pacheco-Torgal insists that the book 'has no intention to be even close to a treatise on the subject of concrete eco-efficiency' and explains instead that 'the sole purpose of this book is therefore to display recent investigations on eco-efficient concrete'. It is fair to say that the book largely achieves this objective, but this reviewer would also like to have seen some participation from researchers in North America, plus some input from practising (non-academic) engineers and materials scientists on practical implementation issues.

Overall, the book is well presented and sensibly structured, although hardly glamorous, with its 'one-of-a-series' external appearance and lack of any colour images or diagrams. However, given that none of the editors and only two of the authors are from anglophone countries, the editors are to be congratulated on a text in the English language that is easily readable and consistent in concise style throughout the book.

All of the 21 chapters are well supported by abundant figures and some tables, with the former being mainly scientific diagrams, charts and graphs, rather than photographs. Most notably and usefully, every chapter is completed by an extensive list of references, emphasising the overall objective to provide background to and a summary of each topic, guiding the appetite-whetted reader to more detailed information elsewhere. There is an effective index and no appendices.

After a short supportive foreword by the celebrated Professor Arnon Bentur and a general introduction by the lead editor, the book is arranged into 21 chapters, which are grouped into four parts. Part I (Chapters 1–3, 78 pages) covers the eco-efficiency of traditional Portland cement concretes. Part II (Chapters 4–11, 188 pages) addresses concrete made using 'supplementary cementitious materials' (SCMs), such as various natural and artificial pozzolanic additions, with the largest chapter (45 pages) rightly devoted to their influence on durability. Part III (Chapters 12–16, 164 pages) concerns concrete made with non-reactive wastes, with the largest chapter (51 pages) being a most valuable account of the various polymers that can be added to fresh or hardened concrete, or used to reduce the cement content. Part IV (Chapters 17–21, 138 pages) is a mixture of two or three separate but important topics; the first three chapters cover 'alternative' binders, such as alkali-activated concretes and geopolymers, as well as sulfoaluminate and magnesia cements. Finally, two concluding chapters of Part IV consider the fascinating potential future roles for nano- and bio-technology in the achievement of eco-efficient concrete.

Prof Bentur, in his foreword to this new book, taking into account the continuing dominance and growing manufacture of concrete for construction worldwide, plus the relatively low embodied energy and carbon per unit volume of concrete, correctly concludes that 'it is a formidable challenge to explore and apply new ways for reducing its ecological and environmental impact'. This book is undoubtedly a substantial contribution to reviewing the many and various options that are available for meeting this 'formidable challenge', and will be an invaluable initial sourcebook for investigators who will participate in solving the problem. Practising engineers may find the book less immediately helpful, but would undoubtedly find it to be an interesting glimpse into the future for concrete materials.

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